A STUDY OF THE FUNGICIDAL ACTION OF 8-QUINOLINOL AND SOME OF ITS DERIVATIVES

BY

CURTIS LEONEL MASON

B.S., Texas A. & M. College, 1940
M.S., Texas A. & M. College, 1942

AN ABSTRACT OF A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN PLANT PATHOLOGY IN THE GRADUATE SCHOOL OF THE UNIVERSITY OF ILLINOIS

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The use of 8-quinolinol and some of its derivatives as fungicides and bactericides was reviewed with particular emphasis being placed on the reports of their use in the field of agriculture. This review covers the work done during the period of 1909 to date.

The study included tests on 8-quinolinol and eleven of its derivatives, bordeaux mixture, and fermate (70% ferric dimethyldithiocarbamate). The methods employed followed the procedure outlined by the American Phytopathological Society Committee on Standardization of Fungicidal Tests. Tests employing a Pythium plate method also were made. The two test organisms used were *Stemphylium sarcinaeforme* (Cav.) Wilts. and *Pythium debaryanum* Hesse. The results were tabulated and a wide range of activity for these chemically related compounds was observed. All of the metal salts of 8-quinolinol except the copper salt produced a two-peaked curve in their effect on the germination of spores of *Stemphylium sarcinaeforme.*

The substitution of chlorine or bromine atoms for hydrogen in the 5 and 7 positions was found to reduce the toxicity of 8-quinolinol. This reduction in toxicity was also observed in the copper salts of these derivatives. The substitution of nitro groups in the 5 and 7 positions eliminated the toxic action of 8-quinolinol entirely.

Copper 8-quinolinolate was found to be more effective than Bordeaux mixture in reducing the germination of spores of *Stemphylium sarcinaeforme* and was more effective than copper sulfate in retarding the growth of *Pythium debaryanum.*

The conversion of concentrations from parts per million to a basis of equal molecular concentration did not eliminate the wide variations in concentrations necessary to reduce or prevent the germination of spores of *Stemphylium sarcinaeforme.*

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The compounds of this group which at some point permitted no germination of spores of *Stemphylium sarcinaeforme* were found to be fungicidal rather than fungistatic.

It was found that the efficiency of any one of these compounds in reducing the germination of spores of *Stemphylium sarcinaeforme* was closely associated with its efficiency in retarding the growth of *Pythium debaryanum.*

From the results of these studies the following conclusions may be made:

1. These compounds did not produce a straight line dosage-response curve as most other compounds do.

2. The fact that not all compounds followed a straight line dosage-response curve makes the use of L. D. 50 a doubtful index for comparing one fungicide with another, unless the entire dosage-response curve from L. D. 0 to L. D. 100 has been determined.

3. The precipitation of the heavy metals by 8-quinolinol so that they are no longer available to the test organism does not explain completely the toxic action of 8-quinolinol and its derivatives tested in these experiments.

4. Substitution of chlorine and bromine atoms for hydrogen atoms in the 5 and 7 positions of 8-quinolinol did not result in an increase in the toxicity of the compound as has been reported for halogen substitutions in some phenol compounds.

5. Copper 8-quinolinolate proved to be a very efficient fungicide in these tests, and it was found to have many properties desirable in a good plant protectant.

VITA

Curtis Leonel Mason was born October 9, 1919, in Morris County, Texas. He attended the grade schools in Winona and Lydia, Texas. In 1931 he entered high school at DeKalb, Texas, and was graduated in 1935 as Salutatorian of his class. He worked on his father's farm from 1935 to 1936 and then entered the State A. & M. College at Magnolia, Arkansas, in 1936 where he enrolled in a course of general agriculture. He was graduated from this institution in 1938 with second honors in his class. The same year he entered Texas A. & M. College and enrolled in the College of Agriculture with a major in Agronomy. In 1939 he was employed by the United States Department of Agriculture, Bureau of Plant Industry, for part-time work as Agent in the Division of Cotton and Other Fiber Crops and Diseases. He continued his studies and received the degree of Bachelor of Science in 1940 with the highest grades in his class in the College of Agriculture.

In September, 1940, he entered the Graduate School of Texas A. & M. College in the Biology Department. He received the degree of Master of Science in January, 1942, and immediately entered the Graduate School of the University of Wisconsin. He was appointed Research Assistant in the Department of Botany, and his major studies were in Plant Pathology and Plant Physiology.

He served from July, 1943, to December, 1945, in the U. S. Army Air Forces as Aerial Navigator.

In February, 1946, he was appointed Special Research Assistant in the Division of Plant Pathology and entered the Graduate School in the University of Illinois. He holds this position at the present time. He is a member of Sigma Xi and the American Phytopathological Society.

He was married to Miss Mary Funkhouser of Stephenville, Texas, in May, 1942, and now has one son, Robert Lester, 1½ years of age.